HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Reiter Pond Summer Steelhead Program
Species or Hatchery Stock:	Skykomish Summer Steelhead (*Oncorhynchus mykiss)*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Snohomish River Puget Sound
Date Submitted:	March 17, 2003
Date Last Updated:	March 20, 2003

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Reiter Pond Summer Steelhead Program

1.2) Species and population (or stock) under propagation, and ESA status.

Skykomish River Summer Steelhead *(Onchorynchus mykiss)* - not listed

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

1.4) Funding source, staffing level, and annual hatchery program operational costs.

The Reiter Pond summer steelhead program is funded by State Wildlife funds.

1.5) Location(s) of hatchery and associated facilities.

Reiter Pond is located on the Skykomish River (07.0012), a tributary to the Snohomish River (07).

1.6) Type of program.

Isolated harvest

1.7) Purpose (Goal) of program.

Augmentation. The goal of this program is to provide recreational harvest opportunity in the Snohomish River basin (WRIA 07.0000).

1.8) Justification for the program.

This hatchery program will be operated to provide fish for harvest while minimizing adverse effects on listed fish. This will be accomplished in the following manner:

1. Hatchery fish will be released as smolts at a time to minimize or eliminate adverse interactions with listed fish.

2. Only appropriate stocks will be propagated.

3. Hatchery fish will be externally marked to distinguish them from wild steelhead.

4. Fish will be acclimated before release when possible.

5. Hatchery fish will be propagated using appropriate fish culture methods and consistent with the Co-Managers' Disease Policy, spawning and genetic guidelines and state and federal water quality standards.

6. These hatchery fish will be harvested at a rate that does not adversely effect wild steelhead.

7. Juvenile fish produced in excess to production goals will be dealt with appropriately, such as by being planted in a lake with no outlet to provide recreational opportunity.

1.9) List of program "Performance Standards".

See below

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

Performance Standards and Indicators for **Isolated Harvest** Steelhead programs

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch
Meet hatchery production goals	Number of juvenile fish released - **210,000**	Future Brood Document (FBD) and hatchery records
Manage for adequate escapement where applicable	Hatchery return rates	Hatchery return records

Minimize interactions with listed fish through proper broodstock management and mass marking. Maximize hatchery adult capture effectiveness. Use only hatchery fish	Number of broodstock collected - **goal: 600**	Rack counts
	Stray Rates	Spawning guidelines Hatchery records
	Sex ratios	Hatchery records
	Age structure	
	Timing of adult collection/spawning - **June through January**	Hatchery records Hatchery records
	Total number of wild adults passed upstream - **only hatchery-origin adults used for broodstock, wilds' released**	Spawning guidelines
	Adherence to spawning guidelines - **see section 8.3**	
Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	FBD and hatchery records
	Out-migration timing of listed fish / hatchery fish - **April-May (chinook) /May**	FBD and historic natural outmigration times
	Size and time of release - **6 fpp/May release**	FBD and hatchery records
	Hatchery stray rates	Hatchery records (marked vs unmarked)
Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines
	HOR spawners	

Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy
	Fish pathologists will diagnose fish health problems and minimize their impact	Fish health monitoring records
	Vaccines will be administered when appropriate to protect fish health	
	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

600 adults will be utilized for spawning purposes.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Snohomish R. watershed (07)	210,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

See section 3.3.1 for escapement and harvest data.

1.13) Date program started (years in operation), or is expected to start.

1975

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Snohomish River watershed (07).
Skykomish River (07.0012)
Snoqualmie River (07.0219)

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

NA

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Snohomish summer chinook spawning in the upper Snohomish and Skykomish basins. This is a native stock that has been classified as depressed due to chronic low escapements (1992 SASSI)

Other Snohomish Basin Chinook populations:
1) Wallace River summer/fall chinook which spawns in the Wallace River. It is a composite stock that has been classified as healthy (1992 SASSI)
2) Snohomish fall chinook stock which spawns in the Snoqualmie basin as well as the Pilchuck River, Sultan River, Woods Creek and Elwell Creek. It is considered to be a native stock and has been classified as depressed due to low escapement trends (1992 SASSI)
3) Bridal Veil Creek Fall Chinook stock spawns in the south fork Skykomish River, including Bridal Veil Creek, as well as the North Fork Skykomish up to Bear Creek (RM 13.1). It is considered to be native and its stock status is classified as unknown (1992 SASSI).

Skykomish Bull Trout:
1) A single stock that spawns in the south fork Skykomish River including West Cady Creek, Goblin Creek, Troublesome Creek, Salmon Creek and the east fork Foss Creek, tributaries to the south fork Skykomish River. This stock is considered to be a native stock that has been classified as healthy based on increasing escapement trends (1998 SASSI bull trout and Dolly Varden appendix).

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

Critical and viable population thresholds under ESA have not yet been determined. SASSI designations are stated in 2.2.1 above.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

1.358 : 1 for 1990 to 1999

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Recent Escapements: (composite of summer and fall run chinook)

1989	3138
1990	4209
1991	2783
1992	2708
1993	3866
1994	3626
1995	3176
1996	4851
1997	4292
1998	6304
1999	4790
2000	6092

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Unknown

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take *(see "Attachment 1" for definition of "take")*.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

The release of fish as described in this HGMP could potentially result in ecological interactions with listed species. These potential ecological interactions are discussed in Section 3.5, and risk control measures are discussed in Section 10.11. Implementation of the program modifications provided in this HGMP, and the actions previously taken by the comanagers, are anticipated to contribute to the continued improvement in the abundance of listed salmonids.

Collection of steelhead broodstock takes place between December and early March oustide the return time of the spring, summer and fall chinook runs. No likely effects to "take" of listed chinook.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

None

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).
*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*

See "take" table

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

NA

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

There are no ESU-wide hatchery plans or other regionally accepted policies currently in place.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

None

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The program benefits the in-river recreational fishery and the Tulalip Tribal fishery.

RETURN		SPORT			TRIBAL		WILD	WILD
YEAR	HATCH	WILD	TOTAL	HATCH	WILD	TOTAL	ESCAP.	RUN SIZE
1975-76								
1976-77			7,136			1,623		
1977-78			26,047			5,745		
1978-79			14,288			5,423		
1979-80			15,368			10,402		
1980-81	6,268	1,004	7,272	5,898	1,506	7,404	2,954	5,464
1981-82	4,076	1,086	5,162	4,819	1,397	6,216	4,160	6,643
1982-83	4,648	1,627	6,275	3,947	1,202	5,149	5,158	7,987
1983-84	8,756	423	9,179	4,049	245	4,294	6,432	7,100
1984-85	10,957	149	11,106	1,094	622	1,716	6,508	7,279
1985-86	8,947	257	9,204	7,885	765	8,650	7,790	8,812
1986-87	9,555	1,032	10,587	9,764	630	10,394	7,672	9,334
1987-88	10,355	2,286	12,641	5,362	979	6,341	7,744	11,009
1988-89	5,997	2,250	8,247	1,825	493	2,318	7,078	9,821
1989-90	6,347	1,888	8,235	3,705	197	3,902	5,386	7,471
1990-91	4,659	839	5,498	873	225	1,098	5,936	7,000
1991-92	10,248	1,209	11,457	1,913	35	1,948	8,588	9,832
1992-93	10,556	1,362	11,918	832	39	871	N/A	N/A
1993-94	5,299	411	5,710			85	6,992	7,403
1994-95	7,654	209	7,863			315	7,722	7,931
1995-96	5,273	379	5,652			((252))	N/A	379
1996-97	3,021	319	3,340			((241))	N/A	319
1997-98	2,067	105	2,172			((58))	5,250	5,355
1998-99	4,307	1,063	5,370			((182))	6,371	7,434
1999-00							2,790	2,790

Once broodstock needs are met the objective is to harvest at as high a rate as possible. Harvest rates on hatchery steelhead in the Snohomish basin have approached 90% in some years.

3.4) Relationship to habitat protection and recovery strategies.

The comanagers' resource management plans for artificial production in Puget Sound are expected to be one component of a recovery plan for Puget Sound chinook under development through the Shared Strategy process. Several important analyses have been completed, including the identification of populations of Puget Sound chinook, but further development of the plan may result in an improved understanding of the habitat, harvest, and hatchery actions required for recovery of Puget Sound chinook.

3.5) Ecological interactions.

The program described in this HGMP interacts with the biotic and abiotic components of the freshwater, estuarine, and marine salmonid ecosystem through a complex web of short and longterm processes. The complexity of this web means that secondary or tertiary interactions (both positive and negative) with listed species could occur in multiple time periods, and that evaluation of the net effect can be difficult. WDFW is not aware of any studies that have directly evaluated the ecological effects of this program. Alternatively, we provide in this section a brief summary of empirical information and theoretical analyses of three types of ecological interactions, nutrient enhancement, predation, and competition, that may be relevant to this program. Recent reviews by Fresh (1997), Flagg et al. (2000), and Stockner (2003) can be consulted for additional information; NMFS (2002) provides an extensive review and application to ESA permitting of artificial production programs.

Nutrient Enhancement

Adults originating from this program that return to natural spawning areas may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

Predation – Freshwater Environment

Coho and steelhead released from hatchery programs may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs, and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). The site specific nature of predation, and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of any specific hatchery program. WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP.

In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented. Risk factors for evaluating the potential for significant predation include the following:

Environmental Characteristics. Water clarity and temperature, channel size and configuration, and river flow are among the environmental characteristics that can influence the likelihood that predation will occur (see SWIG (1984) for a review). The SIWG (1984) concluded that the potential for predation is greatest in small streams with flow and turbidity conditions conducive to high visibility.

Relative Body Size. The potential for predation is limited by the relative body size of fish released from the program and the size of prey. Generally, salmonid predators are thought to prey on fish approximately 1/3 or less their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length (Pearsons et al. 1998). The lengths of juvenile migrant chinook salmon originating from natural production have been monitored in numerous watersheds throughout Puget Sound, including the Skagit River , Stillaguamish River, Bear Creek, Cedar River, Green River, Puyallup River, and Dungeness River. The average size of migrant chinook salmon is typically 40mm or less in February and March, but increases in the period from April through June as emergence is completed and growth commences (Table 3.5.1). Assuming that the prey item can be no greater than 1/3 the length of the predator, Table 3.5.1 can be used to determine the length of predator required to consume a chinook salmon of average length in each time period. The increasing length of natural origin juvenile chinook salmon from March through June indicates that delaying the release hatchery smolts of a fixed size will reduce the risks associated with predation.

Table 3.5.1. Average length by statistical week of natural origin juvenile chinook salmon migrants captured in traps in Puget Sound watersheds. The minimum predator length corresponding to the average length of chinook salmon migrants, assuming that the prey can be no greater than 1/3 the length of the predator, are provided in the final row of the table. (NS: not sampled.)

Watershed	Statistical Week										
	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	43.2	48.3	50.6	51.7	56.1	59.0	58.0	60.3	61.7	66.5	68.0
Stillaguamish [2] 2001-2002	51.4	53.5	55.7	57.8	60.0	62.1	64.2	66.4	68.5	70.6	72.8
Cedar [3] 1998-2000	54.9	64.2	66.5	70.2	75.3	77.5	80.7	85.5	89.7	99.0	113
Green [4] 2000	52.1	57.2	59.6	63.1	68.1	69.5	NS	79.0	82.4	79.4	76.3
Puyallup [5] 2002	NS	NS	NS	66.2	62.0	70.3	73.7	72.7	78.7	80.0	82.3
Dungeness [6] 1996-1997	NS	NS	NS	NS	NS	NS	NS	NS	77.9	78.8	81.8
All Systems Average Length	50.4	55.8	58.1	61.8	64.3	67.7	69.2	72.8	76.5	79.0	82.4
Minimum Predator Length	153	169	176	187	195	205	210	221	232	239	250

Sources:

[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..

[2] Data are from regression models presented in Griffith et al. (2001) and Griffith et al. (2003).

[3] Data are from Seiler et al. (2003).

[4] Data are from Seiler et. (2002).

[5] Data are from Samarin and Sebastian (2002).

[6] Data are from Marlowe et al. (2001).

Date of Release. The release date of juvenile fish for the program can influence the likelihood that listed species are encountered or are of a size that is small enough to be consumed. The most extensive studies of the migration timing of naturally produced juvenile chinook salmon in the Puget Sound ESU have been conducted in the Skagit River, Bear Creek, Cedar River, and the Green River. Although distinct differences are evident in the timing of migration between watersheds, several general patterns are beginning to emerge:

1) Emigration occurs over a prolonged period, beginning soon after enough emergence (typically January) and continuing at least until July;
2) Two broad peaks in migration are often present during the January through July time period; an early season peak (typically in March) comprised of relatively small chinook salmon (40-45mm), and a second peak in mid-May to June comprised of larger chinook salmon;
3) On average, over 80% of the juvenile chinook have migrated past the trapping locations after statistical week 23 (usually occurring in the first week of June).

Table 3.5.2. Average cumulative proportion of the total number of natural origin juvenile chinook salmon migrants estimated to have migrated past traps in Puget Sound watersheds.

Watershed	Statistical Week										
	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	0.61	0.64	0.68	0.73	0.76	0.78	0.83	0.86	0.90	0.92	0.94
Bear [2] 1999-2000	0.26	0.27	0.28	0.32	0.41	0.52	0.73	0.84	0.92	0.96	0.97
Cedar [2] 1999-2000	0.76	0.76	.0.76	0.77	0.79	0.80	0.82	0.84	0.87	0.88	0.90
Green [3] 2000	0.63	0.63	0.64	0.69	0.77	0.79	0.84	0.86	0.88	0.98	1.00
All Systems Average	0.56	0.58	0.59	0.63	0.68	0.72	0.80	0.85	0.89	0.94	0.95

Sources:

[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..

[2] Data are from Seiler et al. (2003).

[3] Data are from Seiler et. (2002).

Release Location and Release Type. The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time the fish released from the artificial production program are commingled with the listed species. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release, and the speed at which fish released from the program migrate from the watershed.

Coho salmon and steelhead released from western Washington artificial production programs as smolts have typically been found to migrate rapidly downstream. Data from Seiler et al. (1997; 2000) indicate that coho smolts released from the Marblemount Hatchery on the Skagit River migrate approximately 11.2 river miles day. Steelhead smolts released onstation may travel even more rapidly – migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). However, trucking fish to offstation release sites, particularly release sites located outside of the watershed in which the fish have been reared, may slow migrations speeds (Table 3.5.3).

Table 3.5.3. Summary of travel speeds for steelhead smolts for several types of release strategies.

Location	Release Type	Migration Speed (river miles per day)	Source
Cowlitz River	Smolts, onstation	21.3	Harza (1998)
Kalama River	Trucked from facility located within watershed in which fish were released.	4.4	Hulett (pers. comm.)
Bingham Creek	Trucked from facility located outside of watershed in which fish were released.	0.6	Seiler et al. (1997)
Stevens Creek	Trucked from facility located outside of watershed in which fish were released.	0.5	Seiler et al. (1997)
Snow Creek	Trucked from facility located outside of watershed in which fish were released.	0.4	Seiler et al. (1997)

Number Released. Increasing the number of fish released from an artificial production program may increase the risk of predation, although competition between predators for prey may eventually limit the total consumption (Peterman and Gatto 1978).

Predation – Marine Environment
WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP. NMFS (2002) reviewed existing information on the risks of predation in the marine environment posed by artificial production programs and concluded:

> "1) Predation by hatchery fish on natural-origin smolts or sub-adults is less likely to occur than predation on fry. Coho and chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish prey that is less than one-fifth of their length (Brodeur 1991). During early marine life, predation on natural origin chinook, coho, and steelhead will likely be highest in situations where large, yearling-sized hatchery fish encounter sub-yearling fish or fry (SIWG 1984)."

> "2) However, extensive stomach content analysis of coho salmon smolts collected through several studies in marine waters of Puget Sound, Washington do not substantiate any indication of significant predation upon juvenile salmonids (Simenstad and Kinney 1978)."

“3) Likely reasons for apparent low predation rates on salmon juveniles, including chinook, by larger chinook and other marine predators are described by Cardwell and Fresh (1979). These reasons included: 1) due to rapid growth, fry are better able to elude predators and are accessible to a smaller proportion of predators due to size alone; 2) because fry have dispersed, they are present in low densities relative to other fish and invertebrate prey; and 3) there has either been learning or selection for some predator avoidance.”

Competition

WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that “migrant fish will likely be present for too short a period to compete with resident salmonids.”

2) NMFS (2002) noted that “..where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates.”

3) Flagg et al. (2000) concluded, “By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids.” Flagg et al (2000) also stated “It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment.”

4) Fresh (1997) noted that “Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results.”

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The primary source of incubation and rearing water for Reiter Ponds is an underground spring. Temperatures typically range from 40 to 55 degrees Fahrenheit. Flows fluctuate depending on the time of year from a low of 3800 gallons per minute (gpm) to a high of 6000 gpm. The facility is covered under NPDES permit # WAG 133006.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

The hatchery intakes at the facility conform with NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Reiter Ponds has an adult trap and ladder that are driven by water from the springs. The adult capture pond is concrete and measures 120' X 8' X 10'. The pond discharges directly to the Skykomish River. The trap is typically operated from June 1 through January 31.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

NA

5.3) Broodstock holding and spawning facilities.

Broodstock are held in the adult trap until spawning occurs in January. A spawning shed is located directly adjacent to the adult pond.

5.4) Incubation facilities.

The incubation facility at Reiter Ponds consists of 6 shallow trough and approximately 80 down-well type iso-bucket incubators.

5.5) Rearing facilities.

Once the eggs have been eyed they are transferred to Wallace River hatchery for hatching and initial ponding. The fry are typically placed in raceways (100' X 10' X 4') where they are raised to approximately 70 fish per pound (fpp). At that point, typically around October 1st, they are transferred back to Reiter Ponds where they are placed in one of the two large rearing ponds (1400' X 90' X 8'). The fish finish their rearing in these ponds and are released in May at 6 fpp.

5.6) Acclimation/release facilities.

See section 5.5.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

The most significant threat to fish loss is disease.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Reiter Ponds is staffed by a full time employee and support by other employees from a nearby hatchery. All staff are very familiar with the workings of the hatchery and have received training in fish cultural techniques and disease recognition and prevention issues. Additionally, fish health staff make frequent visits to the hatchery to check the health of fish stocks and are available immediately in case of disease outbreaks. The hatchery is equipped with a sophisticated alarm system that monitors flow and other conditions critical to hatchery operations.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adult summer steelhead that return to the trap between June 1 and January 31 are used as broodstock.

6.2) Supporting information.

6.2.1) History.

This broodstock was derived from Skamania River summer-run steelhead over 30 years ago and has been self sufficient, at Reiter for approximately 20 years.

6.2.2) Annual size.

600 adults

6.2.3) Past and proposed level of natural fish in broodstock.

Unknown level of natural fish in the past, but all fish used now are of hatchery origin (adipose-fin clipped).

6.2.4) Genetic or ecological differences.

None.

6.2.5) Reasons for choosing.

Locally adapted stock.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

NA

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2) Collection or sampling design.

See section 5.1

7.3) Identity.

All fish returning to the trap with adipose-fin clips (hatchery-origin).

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

600 (300 males, 300 females)

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults				
	Females	Males	Jacks	Eggs	Juveniles
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995	259	252		882,000	
1996	252	285		938,500	
1997	300	235		1,021,000	
1998	259	117		756,000	
1999	222	108		735,000	
2000	175	124		577,500	
2001	227	169 (65 live spawned)		811,500	

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Fish in excess of spawning needs are dispatched and buried on-station. This is necessary because the fish are treated with chemicals for fungus control. The trap is normally closed after 600 hatchery-origin fish are trapped and the remaining fish allowed to remain in the river for recreational harvest.

7.6) Fish transportation and holding methods.

NA

7.7) Describe fish health maintenance and sanitation procedures applied.

Adult broodstock are sampled for virus in accordance with the Co-managers Disease Policy and spawning procedures follow the guidelines set forth in the hatchery division Fish Health Manual.

7.8) Disposition of carcasses.

See section 7.5.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

NA

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Adults are selected randomly from ripe fish available on each spawning day.

8.2) Males.

No back-up males or repeat spawners are used.

8.3) Fertilization.

Equal sex ratios are used and gametes are pooled in lots of 5 if sufficient males are trapped.
5 X 5

8.4) Cryopreserved gametes.

None used.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

NA

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

See section 7.4.2 table. Survival rates to from green egg to ponding have ranged between 95-97%. Pond mortality varies from year to year and is largely attributed to river otter predation which may approach 25% in some years.

9.1.2) Cause for, and disposition of surplus egg takes.

Current management approaches do not allow for the taking of eggs in surplus of program goals. If losses are too high, then goals are not met.

9.1.3) Loading densities applied during incubation.

10,000 eggs per tray.

9.1.4) Incubation conditions.

Temperature of inflowing water is monitored and recorded daily. Dissolved oxygen is checked on an infrequent basis and silt management is accomplished by rodding the trays and brushing tray screens. Since this is a surface water source, siltation is dealt with on a frequent basis and during flood events the incubators sometimes need constant attention.

9.1.5) Ponding.

See section 5.5.

9.1.6) Fish health maintenance and monitoring.

The fish are cared for on a daily basis by trained hatchery specialists. In addition the fish are examined regularly by a Fish Health Specialist.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

NA

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

9.2.2) Density and loading criteria (goals and actual levels).

Numerous criteria are applied depending on the fish's size, the pond style they reside in, water quality, water temperature, relative health and water conditions. However, as a rule, the criteria limits loadings to a maximum of 3 pounds fish/gpm of flow until they have reached a size of 100 fpp.

9.2.3) Fish rearing conditions

Water temperatures are monitored on a daily basis. Water flows are checked at least weekly. Each pond is monitored for loss and loss is picked daily. Ponds are vacuumed on an as-needed basis (typically weekly). General health of the fish is monitored by Fish Health staff on a biweekly basis.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Not available.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Diets are supplied by Moore-Clark and BioOregon. The diets are typically "dry" or "semi-dry" in nature and include starter diets, crumbles and pellet type feeds. Daily percent of body weight fed varies depending on the size of the fish, temperature of the water and time of year. However, the range is usually from 1-3% B.W./day. Overall food conversion is typically 1.1 to1.2.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Fish are sampled during rearing for the incidence of disease in accordance with the Co-Managers Fish Health Policy. Monthly monitoring exams take place to detect pathogens of concern. In the event of disease epizootics or elevated mortality, fish pathologists are available to diagnose problems and provide treatment recommendations.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

NA

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

NA

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

NA

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	210,000	6	May	Snohomish R.watershed*

* Implement with the 2004 releases.

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Snohomish River (07), including the Skykomish & Snoqualmie Rivers

Release point: Reiter Ponds (Skykomish R. (07.0012)), multiple acclimation/planting sites). Snoqualmie River tribs.

Major watershed: Snohomish River

Major watershed: Puget Sound

Skykomish River Plants at:	Reiter Ponds (RM 45)	150,000
	Sultan R.(07.0881)	10,000
Snoqualmie River Plants at:		
	Raging River (07.0384)	50,000

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995							196,700	6
1996							226,400	6
1997							168,700	6
1998							265,300	6
1999							283,941	5
2000							180,938	5
2001							255,534	7
Average							225,359	6

10.4) Actual dates of release and description of release protocols.

Fish are released on-station between May 1 and May 15. The release protocol is forced.

10.5) Fish transportation procedures, if applicable.

Fish are transported in fish tanker trucks equipped with oxygen systems and recirculating pumps.

10.6) Acclimation procedures.

Fish are reared on station from October to release in May.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All hatchery steelhead are adipose-fin clipped.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Programmed levels will be controlled by limiting the number of broodstock collected.

10.9) Fish health certification procedures applied pre-release.

These summer steelhead are fish health certified in accordance with the Co-Managers Fish Health Policy within two weeks of their scheduled release.

10.10) Emergency release procedures in response to flooding or water system failure.

In the case of a catastrophic event conditions critical to the fishes health would be monitored and if deemed necessary the fish would be released prematurely to prevent their loss in the ponds.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize the risk of residualization and impact upon natural fish, hatchery yearlings are released in May as smolts and only in the Snohomish River watershed. All fish released are mass marked.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The comanagers conduct numerous ongoing monitor programs, including catch, escapement, marking, tagging, and fish health testing. The focus of enhanced monitoring and evaluation programs will be on the risks posed by ecological interactions with listed species. WDFW is proceeding on four tracks:

1) An ongoing research program conducted by Duffy et al. (2002) is assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon, and potential predators and competitors, in northern and southern Puget Sound. Funding is provided through the federal Hatchery Scientific Review Group.

2) A three year study of the estuarine and early marine use of Sinclair Inlet by juvenile salmonids is nearing completion. The project has four objectives:

a) Assess the spatial and temporal use of littoral habitats by juvenile chinook throughout the time these fish are available in the inlet;

b) Assess the use of offshore (i.e., non-littoral) habitats by juvenile chinook;

c) Determine how long cohorts of juvenile chinook salmon are present in Sinclair inlet;

d) Examine the trophic ecology of juvenile chinook in Sinclair Inlet. This will consist of evaluating the diets of wild chinook salmon and some of their potential predators and competitors. Funding is provided by the USDD-Navy.

3) WDFW is developing the design for a research project to assess the risks of predation on listed species by coho salmon and steelhead released from artificial production programs. Questions which this project will address include:

a) How does trucking and the source of fish (within watershed or out of watershed) affect the migration rate of juvenile steelhead?

b) How many juvenile chinook salmon of natural origin do coho salmon and steelhead consume?

c) What is the rate of residualism of steelhead in Puget Sound rivers?

Funding needs have not yet been quanitifed, but would likely be met through a combination of federal and state sources.

4) WDFW is assisting the Hatchery Scientific Review Group in the development of a template for a regional monitoring plan. The template will provide an integrated assessment of hatchery and wild populations.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

See Section 11.1.1.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans.

SECTION 12. RESEARCH

12.1) Objective or purpose.

There is currently no research being conducted using Reiter Summer Steelhead.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook ESU/Population: Puget Sound Activity: Reiter Ponds Summer Steelhead Program				
Location of hatchery activity: Skykomish River Dates of activity: June-May Hatchery program operator: WDFW				
Type of Take	Annual Take of Listed Fish By Life Stage (*Number of Fish*)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)		Unknown	Unknown	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:

1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.*